INSECTS IN RELATION TO NATIONAL DEFENSE

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Circular 13

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FLEAS

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March 1941

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INTRODUCTION

Wherever men and such animals as dogs, cats, and rodents are concentrated, conditions are favorable for the development of fleas. Camps and other locations, including ships, where men congregate and where pet and stray dogs and cats occur, or where rats and mice forage in storerooms, provide ideal conditions in which flea populations increase. Fleas annoy man by biting and transmit serious diseases.

Bubonic plague and endemic typhus are transmitted to man by fleas. Plague among wild rodents has spread eastward from the Pacific Coast until ten far western states harbor natural reservoirs of this malady. The fleas necessary to establish an outbreak of plague among man may be transported in shipments of supplies or household goods by motor truck, railroad trains, ships, or even airplanes. This applies also to endemic typhus which is especially widespread in the southern states.

FLEAS OF CONTINENTAL UNITED STATES

Rodent fleas, capable of transmitting disease and found associated with human habitations, are the Oriental rat flea, Xenopsylla cheopis (Roths.); the European rat flea, Nosopsyllus fasciatus (Bosc.) (fig. 1); and the mouse (and rat) flea, Ctenopsyllus segnis (Schön.).

Figure 1 - The European rat flea, female

The Oriental rat flea is potentially the most dangerous of the plague vectors. It is the predominant rat flea of warmer climates, occurs in southern parts of the United States, and is a common flea on rats on ships and in seaports. In recent years it has appeared at various points in the interior of the United States. The European rat flea is a flea of cooler climates. This rat flea and the mouse flea are generally distributed throughout the country. Both of the rat fleas may transmit endemic typhus.

Many species of rodent fleas are capable of transmitting plague, and under certain circumstances they bite man; therefore, this danger should be considered, especially in areas where plague has been found among rodents.

The principal fleas which annoy or bite man are: the cat flea, Ctenocephalides felis (Bouché) (fig. 2); the dog flea, Ctenocephalides canis (Curt.); and the human flea, Pulex irritans (L.) (fig. 3).

Figure 2 - Cat flea, female

Figure 3 - Human flea, female

Cat and dog fleas breed on cats and dogs alike, and, when numerous or in the absence of the natural hosts, attack man. They breed on various other animals also. The cat and dog fleas are abundant in the eastern part of the United States, but are relatively scarce in the West.

Human fleas attack man as well as dogs, cats, hogs, and other animals. They are annoying in buildings, stables, and surrounding premises, especially in the Middle West, South, and on the Pacific Coast where this species is the predominant one affecting man. It is chiefly important because of its vicious bite. In laboratory experiments it has transmitted plague, and its possible importance in this connection should not be overlooked.

FLEAS OCCURRING IN TROPICAL AMERICA

The following fleas associated with man have been reported from Panama: the cat flea, the human flea, the Oriental rat flea, the European rat flea, and the mouse flea. These same species are encountered on the Caribbean islands.

In sub-tropical and tropical America, an additional pest is encountered. This is the "chigoe" flea, known scientifically as Tunga penetrans (L.). This should not be confused with the North American "chigger" which is a mite. The chigoe is responsible for ulcerated sores on the soles of the feet, under toenails, and between the toes. Other parts of the human body are occasionally attacked. Domestic animals, especially hogs, are hosts and serve as a source of human infestation.

It is reported that during the East African Campaign in the last World War, this flea not only caused much suffering, but considerable loss of man power, due to its crippling effects.

"Chigoe" control includes ridding the premises of fleas and eggs, and treating domestic animals as outlined later in the case of other fleas. As a protection, shoes should be worn. Chigoes are removed from the body with a sterilized needle or knife-blade, and the open wound treated with an antiseptic.

IDENTIFICATION

Because of the similarity in appearance and habits of some of the species of fleas, it is impossible for anyone but a specialist to determine definitely what species are causing trouble. A specific identification may be obtained by sending specimens to the Bureau of Entomology and Plant Quarantine, Department of Agriculture, Washington, D. C. Fleas should be dropped in vials containing 70% (ordinary rubbing) alcohol and forwarded with the name of the collector, place and date of collection, and host from which taken.

BIOLOGY

For breeding, all fleas must have access to warm-blooded animals. Adult fleas lay their eggs in the fur and feathers of the animal host. These eggs drop off and lodge in the sleeping quarters of the animal, or in cracks in floors, out-of-doors on the ground, etc. The eggs hatch in a few days into larvae (fig. 4) - small worm-like creatures which subsist on the debris found on the floor or ground. In two weeks or more the larvae become full-grown and enclose themselves in tiny cocoons (fig. 5) in which they transform to adult fleas in the course of a few days or longer. When the adult stage is reached, the new crop of fleas apparently "born hungry" become quite active in search of food, although they may subsist for weeks without nourishment.

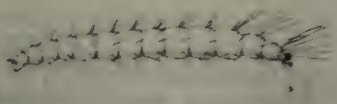

Figure 4 - Flea larva

Figure 5 - Flea cocoon

"Sand-flea" infestations are due to fleas hatched from eggs dropped from cats or dogs. The animals may have been away from the premises for a month or two, but the flea eggs remain to complete development. Consequently, when a person enters a cellar, vacant building, or yard, he is besieged by hundreds of voracious fleas which apparently have bred in the dust or sand.

The life history of the chigoe flea is an exception to that of the usual flea, and is discussed here with control measures to avoid confusion with other species. The female attaches herself firmly by means of her mouthparts to the skin of the host. Consequent irritation causes a swelling which envelops the insect except for a tiny opening where the tip of the abdomen is exposed. Through this

opening the flea obtains air and extrudes eggs which drop to the ground or remain within the swelling. After oviposition the female remains to cause continued infection. Serious results may follow when several chigoes penetrate in close proximity to one another.

Rodent fleas breed in the nests and burrows of their hosts, and the adult fleas are often present in great numbers on these hosts, but they also occur in and about the burrows.

CONTROL

To effectually combat fleas, it is essential to determine the source of the infestation, to treat or destroy the animal host, and to destroy the immature stages in the dust on floors or in the burrows of rodents.

Outbuildings

To clean up an infestation of fleas in buildings, nothing is better than a light spraying of creosote oil without dilution. This substance, however, is strongly odorous and will burn animals and plants, stain painted surfaces, and damage prepared foods. Its use is recommended where these properties are not important considerations. It may be used in such situations as basements, warehouses, outbuildings, dog kennels, and beneath buildings. A compressed-air sprayer or a bucket pump (see Cir. 20) with a lead of high-pressure hose with tight connections is the most satisfactory device for applying the material.

Living Quarters

For the control of fleas in living quarters the use of flake naphthalene is advised. In dwelling houses, about 5 pounds should be scattered over the floor of each room. Treated rooms should be left closed for at least 24 hours. If desired, one room may be treated at a time, then the naphthalene may be swept up and used in another room. The amount of this material to be used in extraordinarily large rooms should be in the same proportion

as given above. In any case the floors should be sufficiently well covered to make them white in appearance. Where cats have been sleeping on overstuffed furniture these pieces should be covered with the naphthalene. Where there are only a few scattered fleas in quarters these may be killed by a commercial fly spray applied with a spray gun.

Treatment of Domestic Animals

In addition to the treatment of premises as described above, attention should be given to dogs, cats or other animals which may serve as flea hosts. Often infestations arise from stray animals gaining access to certain parts of buildings. Therefore, all windows, ventilators, etc., should be checked to see that they are closed with glass, screens or otherwise. In the case of animals kept in quarters, treatments of the individual animal with derris or cube powder should be carried out systematically, usually every two weeks.

A small amount of derris powder (a level teaspoonful for a large dog) should be placed next to the skin along the back and neck and on top of the head. For smaller animals the amount should be reduced according to size. Care should be taken not to overdose cats, especially the long-haired breeds, as licking this material from the coat may cause illness. In fact, since the effectiveness of derris is largely dependent upon the amount of rotenone it contains, and much of the derris now on the market contains a comparatively high rotenone content, this material for use on cats may be safely diluted with talcum powder in the proportion of 1 part derris to about 4 of talcum. An ordinary salt cellar will be found useful in applying the powder as the hair is parted with one hand. This treatment should be repeated at intervals of 2 weeks where the animals have free run in order to prevent reinfestation of living quarters.

Control of Rodent Fleas

Rat fleas are most effectively combated by destroying the rats and mice with poison baits, traps, or by fumigation with hydrocyanic acid gas or methyl bromide (see Cir. 22). Since these fumigants are dangerous to man they should be used only by a trained, experienced operator.

Spraying the nests and runs with creosote oil will destroy the fleas actually struck. Of course, if a proper fumigation is carried out for rat control, all fleas will be destroyed in the building, but spraying may be necessary beneath the building or in other places where the full charge of gas does not reach.

Methyl bromide is an effective insecticide and rodenticide. It kills rodents and the fleas whether on them or in the burrows. Methyl bromide is noninflammable and is effective in wet or dry soils at various temperatures. However, because it is odorless and colorless, apt to cause burns and dermatitis by careless handling, and rather high in price, this fumigant is not recommended generally. Personnel should be trained in its use and should function only under competent supervision. Grains and similar cargoes may be treated for fleas with this fumigant without rendering the food unfit for human consumption. Rat burrows may be effectively fumigated and all stages of fleas from eggs to adults killed. The dosage of methyl bromide recommended for ground squirrels is 10 cc. per burrow. Applicators consist of small steel cylinders equipped with a measuring device.

Prevention of Spread of Fleas

Transportation of fleas should be prevented as far as possible. Household effects may harbor these pests in all stages, especially as immature forms in rugs and furniture. Fleas may be transported among mail sacks or other materials used by animals for beds. Persons carrying infested clothing or bedding may spread fleas. Motor trucks, railroad trains, airplanes, and ships must therefore be considered in combating fleas.

Thorough cleaning and, when necessary, spraying and fumigation of conveyances are recommended. On ships where men are housed as well as transported, living quarters and pets should be treated in accordance with measures already given. Rats should be exterminated by fumigation and excluded at ports by the use of effective rat guards.

Treatment for Flea Bites: Prevention of Bites

Individuals differ considerably in their reactions to flea bites. In some cases the irritation is slight and

may be forgotten quickly. In others it persists and if the bites are numerous considerable discomfort may result. In any case, the site of the bite should not be scratched as this may lead to infection. Cooling lotions usually give relief. Among the applications which have been recommended are: mentholated ointments, spirits of camphor, carbolated vaseline, and hydrogen peroxide.

Fresh pyrethrum powder is repellent to fleas and may be sprinkled on the underwear and socks and on the bedding when there appears to be danger of being bitten.

Cots or beds may be isolated from fleas by setting the legs in tin covers containing water or a little kerosene and by exercising care not to let the bedding get near the floor.

REFERENCES

Bishopp, F. C. ----- 1931 -- Fleas and Their Control. Farmers' Bull. 897, U.S. Dept. of Agriculture, Bur. of Entomology, Div. of Insects Affecting Man and Animals, Washington, D. C. 16 pp.

Dyer, R. E., ------- 1932 -- Endemic Typhus of the United
Ceder, E. T., States. Jour. Infect. Dis-
Rumreich A., and eases 51(1):137-161.
Badger, L. F.

Fox, Carroll and --- 1925 -- A Comparative Study of Rat-
Sullivan, E. C. Flea Data for Several Seaports of the United States. Pub. Health Repts. 40(37): 1909-1926.

Fox, Irving -------- 1940 -- Fleas of Eastern United States. Iowa State College Press, Ames, Iowa, 191 pp.

Jennings, A. H. ---- 1910 -- Rats and Fleas in Relation to Bubonic Plague (with Special Reference to Panama and the Canal Zone). Paper read at a meeting of the Med. Assoc. of the Isthmian Canal Zone. I.C.C. Press. Quartermaster's Dept. Mt. Hope, C. Z.

Patton, Walter Scott -- 1929 -- Insects, Ticks, Mites and
and Evans, A. M. Venomous Animals of
Medical and Veterinary
Importance. Part I -
Medical. H. R. Grubb Ltd.,
Croydon, England.

Russell, Harold ------- 1913 -- The Flea. G.P.Putnam's
Sons, New York. 125 pp.

Silver, James --------- 1927 -- Rat Control. Farmers' Bull.
No. 1533, U. S. Dept. of
Agriculture, Bur. of
Biological Survey, Div. of
Predatory-Animal and Rodent
Control, Washington, D. C.
20 pp.

Stewart, M. A. and ---- 1938 -- The Control of Sylvatic
Mackie, D. B. Plague Vectors. Amer.
Jour. Hyg. 28(3): 469-480.

Trembley, Helen Louise- 1940 -- Distribution and Hosts of
and Bishopp, F. C. Some Fleas of Economic
Importance. Jour. Econ.
Ent. 33(4): 701-703.